Science, Service, Stewardship

Units to conserve—Marine Mammals

Dr. Barbara L. Taylor

Overview

Case studies

NOAA FISHERIES SERVICE

NOAA
FISHERIES
SERVICE

Mission

The MMGG identifies population structure using primarily genetic data. Population structure is identified at two levels: the evolutionary level, which is integral to implementing the Endangered Species Act, and the demographic level, which forms the basis for conservation under the Marine Mammal Protection Act.

Links with Mandates, Needs of Regulatory Partners

- Units to Conserve for MMPA
  - Delimit Population Stocks for MMPA
  - Assign human caused mortalities to stock (and sometimes species)
  - Regulatory partners include: Navy, BOEM, Marine Mammal Commission (any entity requiring MMPA permit)
- Units to Conserve for ESA
  - Delimit DPSs, subspecies and species
  - Assign human caused mortalities to DPS (and sometimes subspecies or species)
  - Regulatory partners include: Navy, BOEM, Marine Mammal Commission (any entity requiring ESA consideration for permits)
- Use of collection by domestic and international collaborators
  - Delimitation of UTCs for various entities (IWC, IUCN) facilitates
  - Regulatory partners include: IWC, Mexico and Canada for transboundary stocks

NOAA
FISHERIES
SERVICE

Cases chosen to illustrate our comprehensive expertise

1) Management driven science
2) A genetics tissue collection with taxonomic, geographic and temporal depth
3) Laboratory skills to maintain quality with high throughput for standard markers while developing new markers to increase the power to resolve questions
4) Analytical skills to interpret data in a management context
5) Synthesis of other lines of evidence with genetic data (the depth of our Division)
6) Leadership role in integrating science with conservation

NOAA
FISHERIES
SERVICE

MMGG research Categories

—Stock specific studies (MMPA)
—Taxonomy (ESA)
—Analytical research
—Advancing conservation science
—Research and development
—**Science infrastructure**
—Capacity building

NOAA FISHERIES SERVICE

Science Infrastructure

Genetics tissue collection

Genetics database

Biopsy database

Genomics database

Species ID/UTC ID

Laboratory technology (maintenance & upgrades)

Training

Good

Medium

Poor

NOAA FISHERIES SERVICE

Capacity building

—Mentoring
- graduate students
- post-docs
- visiting scientists
- volunteers

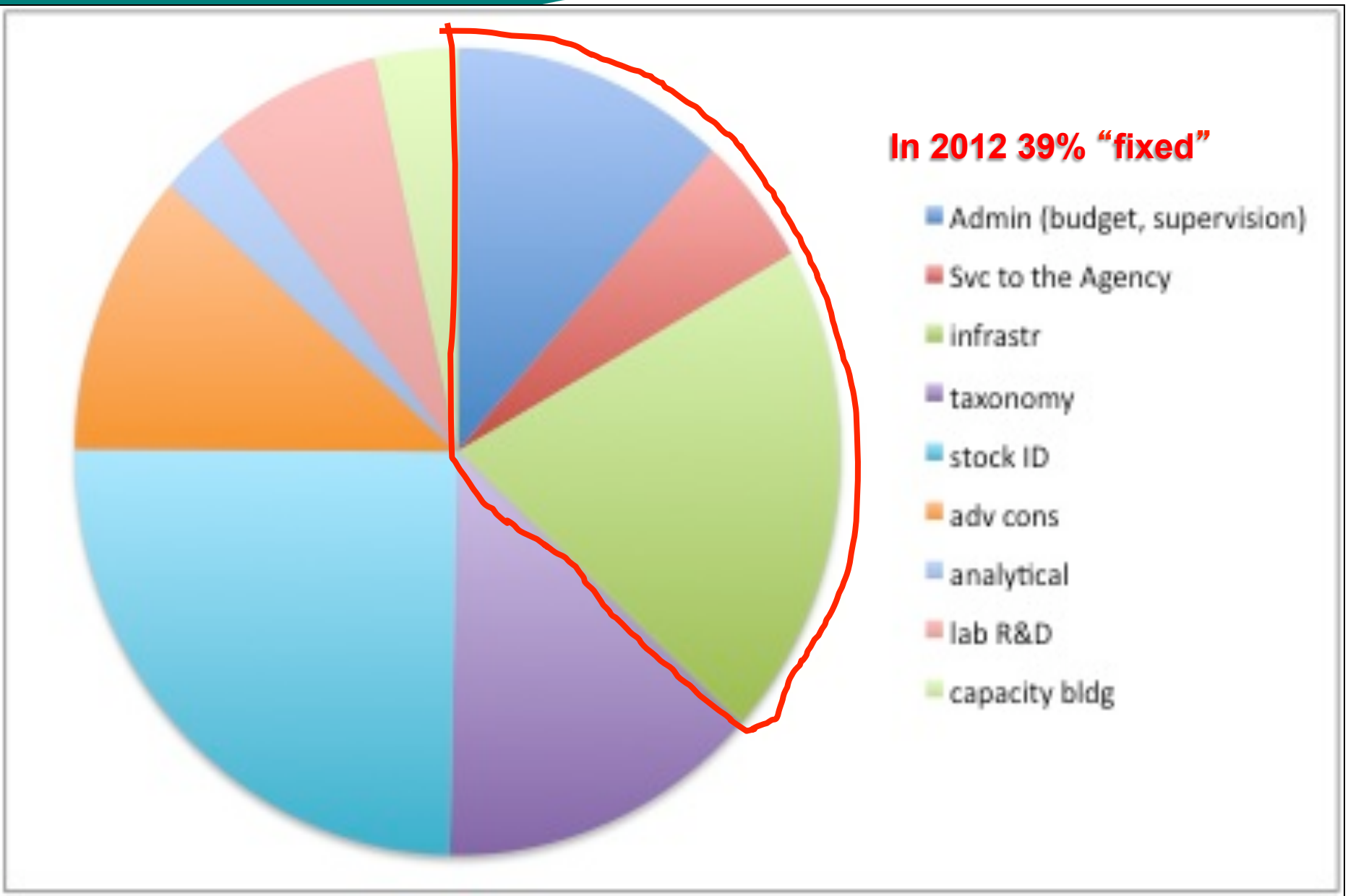
—Teaching

—Loans from the collection

Good
Medium
Poor

NOAA FISHERIES SERVICE

How we spend our time



NOAA FISHERIES

Prioritization table Southwest/Hawaii Stocks

Species	Stock	Center	N	N weight	strategic	trends	risk	manage	indicator	Overall
false killer whale	insular	HI	123	10	0	3	16	1	0	17
bottlenose dolphin	HI big I	HI	102	10	0	2	13	0	2	15
bottlenose dolphin	Kauai	HI	147	10	0	2	13	0	2	15
bottlenose dolphin	4-islands	HI	153	10	0	2	13	0	2	15
false killer whale	pelagic	HI	not small	0	1	3	5.5	1	0	6.5

Regional breakdown for the top 30 ranked stocks

Alaska—14

Southwest--9

Hawaii--7

NOAA FISHERIES SERVICE

Advancing conservation science

Research that will contribute rigor, transparency and efficiency to conservation science

Improve transition from data analysis to decision making

- —Improving stock definition in cases without genetic data
- —Subspecies special issue

Using of Multiple Lines of Evidence to Delineate Demographically Independent Populations

Southwest Fisheries Science Center, La Jolla, CA

19-21 August 2014

Lead by Karen Martien, Aimee Lang and Barbara Taylor from SWFSC with steering committee

NOAA FISHERIES SERVICE

Guidance from GAMMS regarding stock delineation:

Demographic independence can be inferred from many types of information

No guidance on how to consider or weight the different lines of evidence

NOAA FISHERIES SERVICE

Assessing Strength of Lines of Evidence

"Assuming that you have robust data that show a difference among two or more groups of animals in the line of evidence concerned, then, based upon the current state of knowledge of that species, how useful would you rate this line of evidence as a means of delineating separate populations?"

Line of Evidence	Large whales	Odontocetes	Pinnipeds
Morphology	Strong	Strong	Strong
Genetics	Strong	Strong	Strong
Movements	Strong	Strong	Strong
Distributional hiatuses or low density areas	Medium	Medium	Medium
Contaminants	Medium/Weak	Medium/Weak	Medium/Weak
Stable isotopes and fatty acids	Weak/ Not Informative	Weak	Not Informative
Life history	Weak	Weak	Weak
Trends in abundance	Weak	Weak	Weak/ Not Informative
Physiographic or oceanographic differences in habitat	Not informative	Medium	Weak
Association data	Not Informative	Medium/Weak	Unknown
Acoustics	Species Specific	Species Specific	Species Specific

NOAA
FISHERIES
SERVICE

Best Scientific Information Available

MMPA directs NMFS to use the best scientific information available when preparing SARs

1995 SARs delineated stocks at very large scales, commensurate with limited information on population structure available at that time

Since 1995, revisions have occurred primarily for species where strong lines of evidence are attainable, e.g.,

- CA/OR/WA harbor porpoise – **genetics** and **movement**
- AK harbor seals – **genetics** and **movement**
- HI false killer whales – **genetics** and **movement**

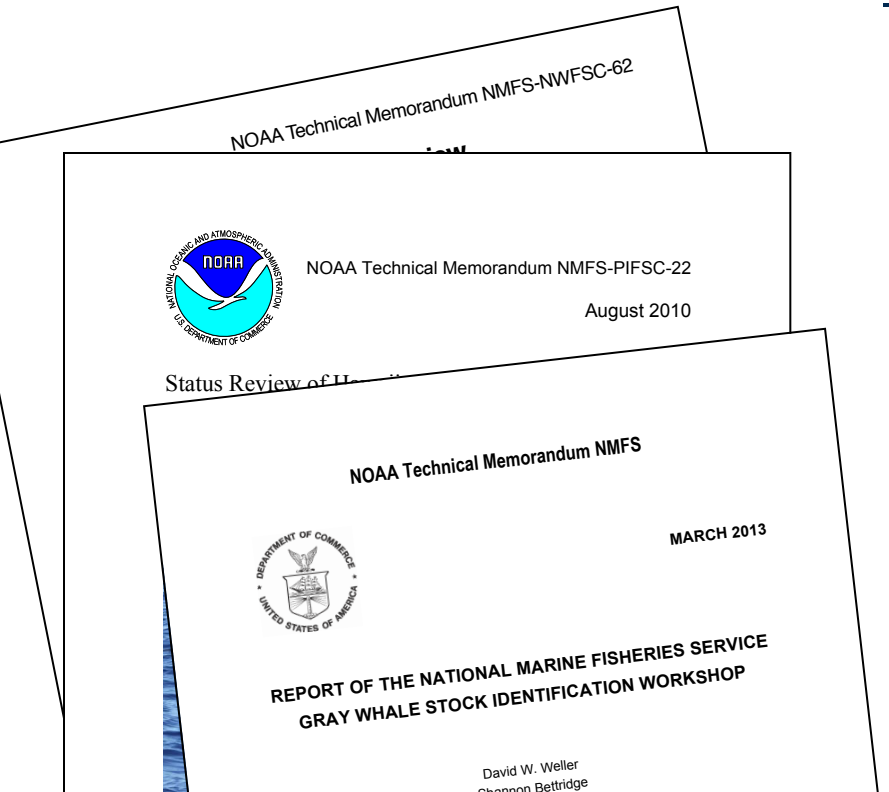
NOAA FISHERIES SERVICE

- What constitutes ‘best scientific information available’ for a given stock?
- Completing the Data Availability Table to address this question
- Assessing the data availability for every LoE for every cetacean and pinniped stock in the 2013 SARs

NOAA FISHERIES SERVICE

Integrating Multiple Lines of Evidence

- Use a formal decision-making framework, such as Structured Expert Decision Making (SEDM) when:
  - Best scientific information available come from weak LoEs or limited data sets
  - Robust data sets from strong LoEs indicate that it is a borderline case



NOAA FISHERIES SERVICE

Why do we care about taxonomy?

NOAA was petitioned to list Southern Resident Killer whales as a DPS under the ESA

Criteria to qualify as a Distinct Population Segment under the Endangered Species Act are relative to taxonomy

- —Persistence in an ecological setting unusual or unique for the taxon
- —Loss would result in a significant gap in the range of the taxon
- —Differs markedly from other populations of the species in its genetic characteristics

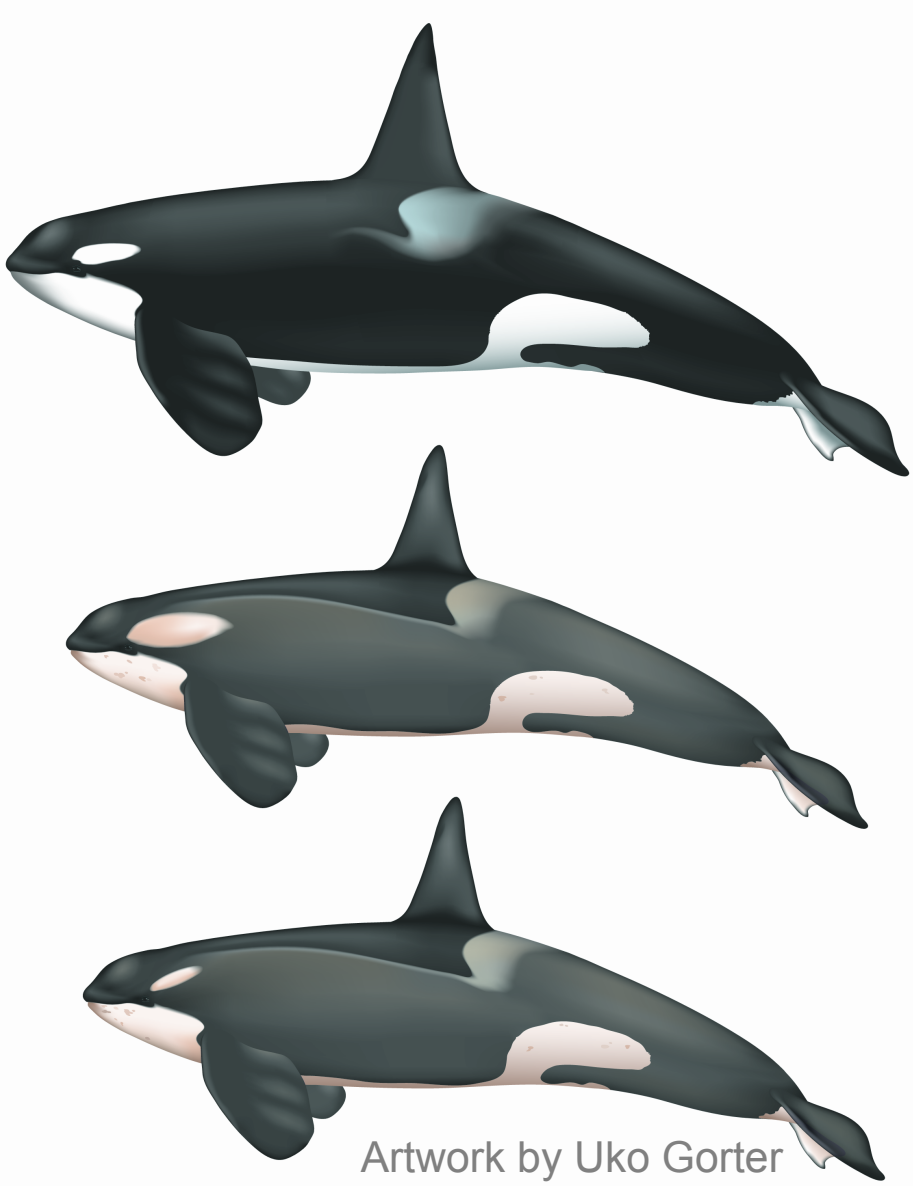
NOAA FISHERIES SERVICE

Killer whales—one global species?

Killer whales can differ in

- —Coloration
- —Diet
- —Size
- —Habitat
- —Group size
- —Vocalizations
- —Social structure

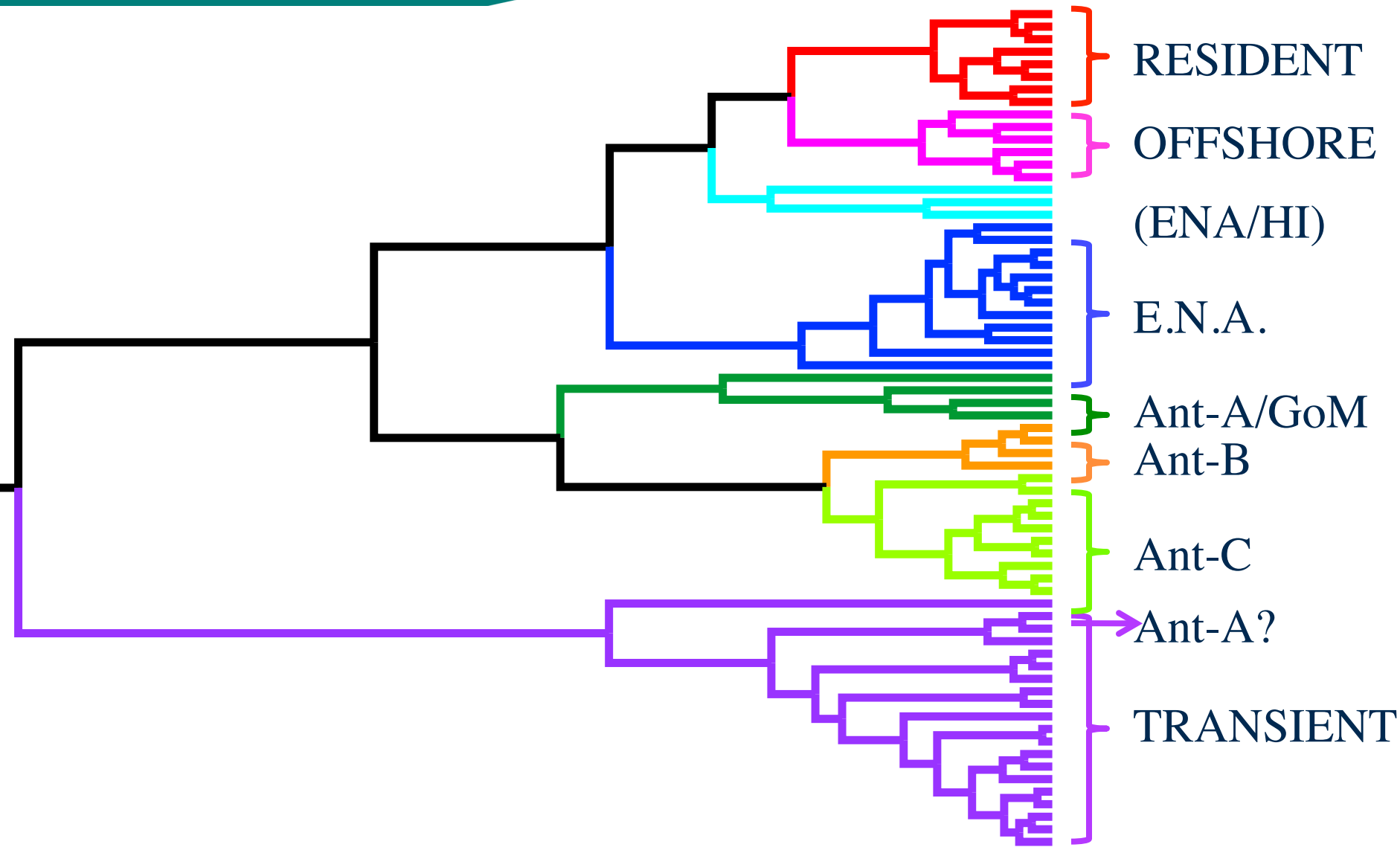
Few skulls



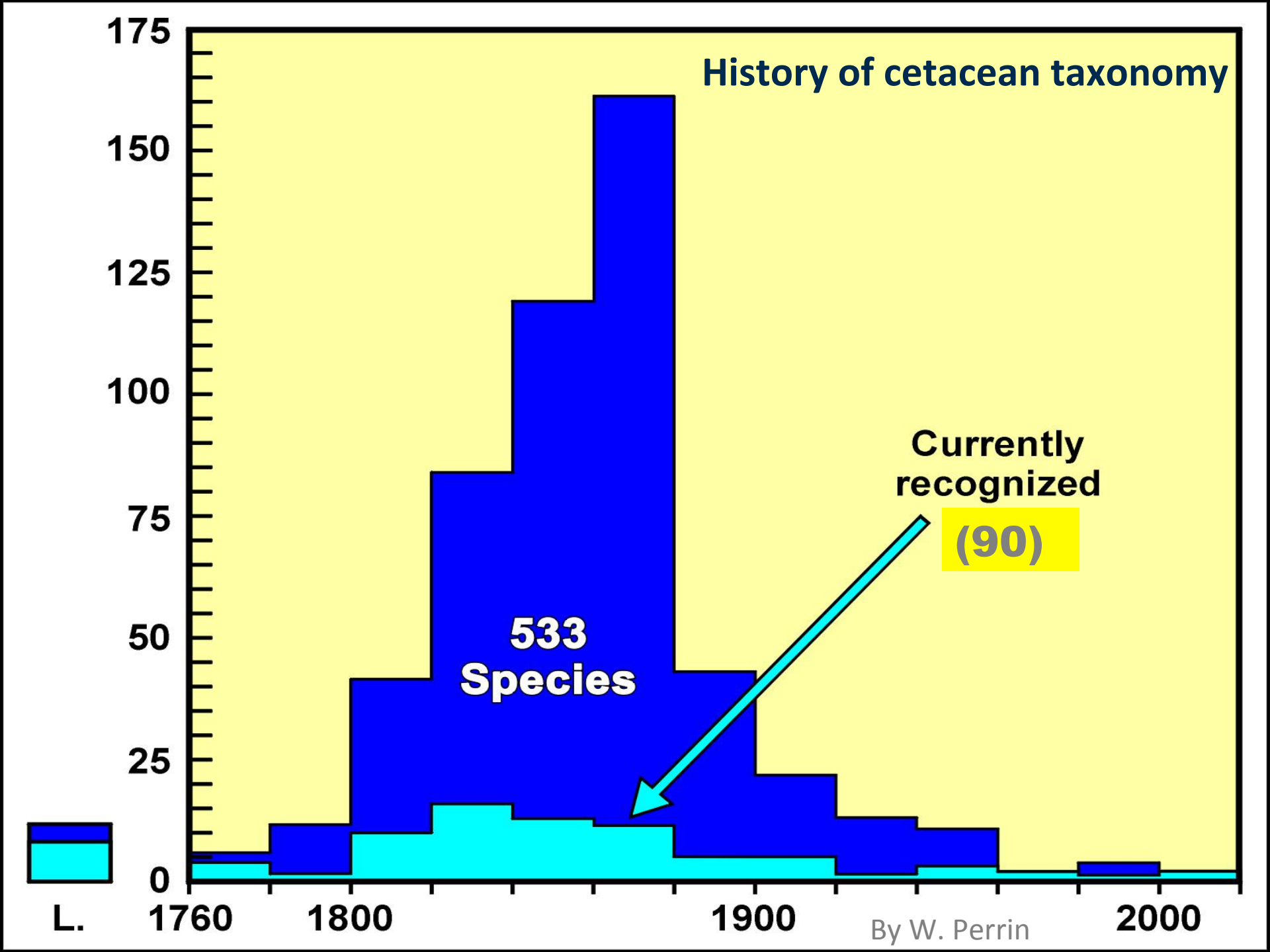
Artwork by Uko Gorter

NOAA FISHERIES SERVICE

Killer whale mitogenomics



Morin et al. 2010

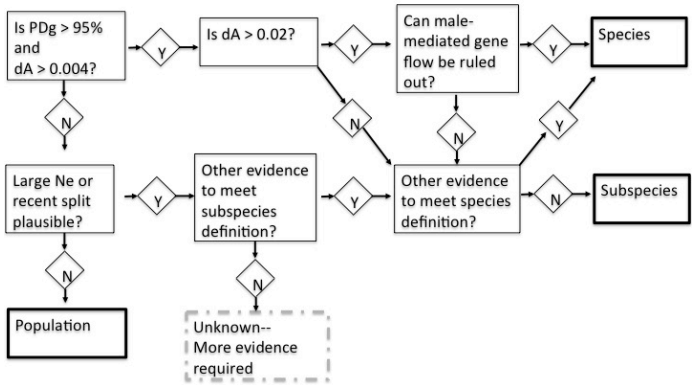

History of cetacean taxonomy
175
150
125
100
75
50
25
0
533
Species
Currently
recognized
(90)
L.
1760
1800
1900
2000
By W. Perrin

Family	Species #	Subspecies #	# of taxa with a high probability of an under-classification error
Balaenidae	4	0	0
Balaenopteridae	8	12	7
Delphinidae	36	22	23
Eschrichtiidae	1	0	0
Iniidae	1	3	2
Kogiidae	2	0	2
Monodontidae	2	0	0
Neobalaenidae	1	0	0
Phocoenidae	7	8	5
Platanistidae	1	2	2
Pontoporia	1	0	1
Ziphiidae	21	0	3
Total	87	47	45

From a journal club came the idea for:

Special Issue of Marine Mammal Science on delimiting subspecies using genetic data

- **6 papers leading up to: Proposed guidelines and quantitative standards for improving rigor in cetacean subspecies and species delimitation (Taylor et al.) (3 accepted, 1 submitted, 2 in internal review)**
- **Formation of a Taxonomy Committee in the Society for Marine Mammalogy**
  - **Maintains list of recognized taxa**
  - **Offers opinion of an independent group of taxonomists when ESA status reviews encounter taxonomic uncertainty**
    - **Humpback whales**
    - **Gulf of Mexico Bryde's whales**



NOAA FISHERIES SERVICE

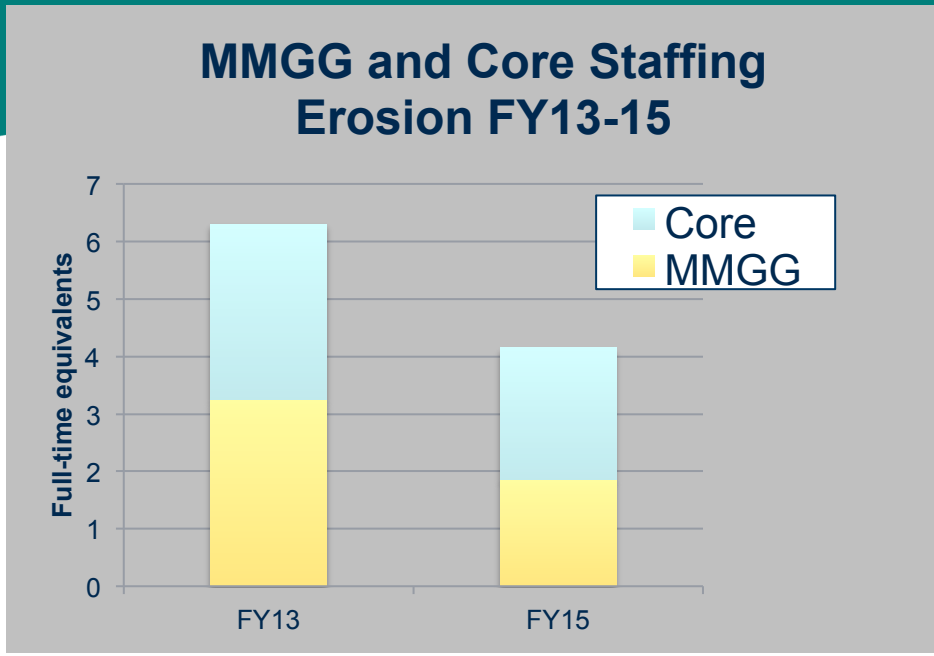
Strengths

- Collection – long-term vision and capacity
- Comprehensive expertise
  - —Critical mass to cover a rapidly changing field and provide rapid service to the agency in species identification and high risk projects
- Innovation
  - —Advancement of the field of defining and delimiting UTCs
  - —Lab methods
  - —Analytical methods
- Collaboration
  - —Use of collection and expertise to collaborate with both field and laboratory researchers

NOAA FISHERIES SERVICE

Challenges

- Maintaining capacity
  - —Personnel



  - —Infrastructure (internal funds cover ½)
- Maintaining collaborations
- Maintaining scientific profile
  - —Reduced ability to attend scientific meetings
- Insufficient capacity to manage/curate data

Strategies

- Strategic thinking
  - —Annual prioritization retreat
  - —Continual progression towards more efficient laboratory technologies
- Coping strategies
  - —Bringing in outside funds
  - —Increasing use of volunteers
  - —Conduct data management and infrastructure support with science staff
  - —Shifting to projects that use existing data from project that generate data

Questions?